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DEPENDENCE OF SPORADIC-E LAYER AND LOWER THERMOSPHERE DYNAMICS ON SOLAR ACTIVITY

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ABSTRACT

The influence of solar activity level on frequency and stochastic sporadic-E layer parameters is considered for station Moscow (56 N, 37 E) during three solar cycles (1958-1988). Es layers with various intensity levels and times of appearance were considered separately. Some regularities of sporadic-E layer reaction to variations of solar activity are revealed. An explanation of the revealed regularities is offered in terms of dynamic processes of the neutral atmosphere.

INTRODUCTION

The influence of solar activity on the sporadic-E layer has been investigated by a number of scientists (Baggaley, 1984; Chavdarov et al., 1975; Whitehead, 1970; Whitehead, 1989), where they reported examples of both the revealing of positive and negative correlation of Es with the solar activity level and the absence of correlation. They also reported the dependence of Es layer response to solar activity on latitude, season, time of the day and the type and intensity of Es layer. It was discovered (Chavdarov et al., 1975) that mean magnitudes of frequency parameters of midlatitude sporadic-E layers decreased at lower levels of solar activity. The percentage of sporadic-E layers with weak intensity and long duration increased together. Durations of observed intense Es layers also decreased during the maxima of solar activity cycles. Baggaley (1984) discovered a direct relationship between sporadic-E layer intensity observed during the day and solar activity level. So, the question of the influence of solar activity on the midlatitude sporadic-E layer is still not fully resolved and an additional analysis of this question will be useful.

DATA PROCESSING TECHNIQUE

The hourly data of maximum frequency of the ordinary wave reflected from the Es layer - foEs and monthly averaged data for maximum frequency of the ordinary wave reflected from the E layer - foEm obtained at Moscow station (56 N, 37 E) during the period 1958-1990 were used for the analysis. Data for the prevailing neutral wind measured by meteor radar at Kazan (56 N, 49 E) within the height range 80-110 km during the period 1986-1990 were also used. Yearly average numbers of sun spots, W, for the same period were used as a parameter characterizing solar activity level. The distance between the ionosonde at Moscow and the meteor radar at Kazan is approximately 700 km, measurements obtained in the west sector of the radar field of view were chosen from the available wind data. The distance between the areas of measurement of sporadic-E layer parameters and wind parameters in this case is